Correct the 40 multiple choice questions from the placement test:

Solutions

- *Let's have a look at any problems*

$$y = x^M \iff \log_x y = M$$

$\log_3 18 \Rightarrow$ " 3 Raised to what exponent equals 18? "

Change of Base

$$\frac{\log 18}{\log 3} \doteq \underline{\underline{2.63}}$$

$\Rightarrow$ Common Logarithm (Base 10)

$\Rightarrow$ Natural Logarithms (Base e)

16. $\dfrac{1}{(8x^3)^{1/3}} \cdot (4x^2)^{1/2} \leftarrow \sqrt{}$

$(8x^3)^{1/3} \leftarrow \sqrt[3]{}$

$\dfrac{2x}{2x}$

$= 1$

18. $\log 4 + \log 5$

$\log(4 \times 5)$

$\log 20$

5. $\dfrac{1}{x-2} - \dfrac{1}{x+2} \Rightarrow \dfrac{1}{a} - \dfrac{1}{b}$

$$\frac{1(x+2) - 1(x-2)}{(x-2)(x+2)} \qquad \frac{b-a}{ab}$$

$$\frac{4}{(x-2)(x+2)}$$

$$\frac{4}{x^2-4}$$

Complex Numbers

Look at the following equation...

$x + 1 = 0$, $x \in W$ ← No Solution over the whole numbers

If we extend to the integers or real number systems then there will be a solution.

What about the equation $x^2 + 1 = 0$, $x \in R$?

$x^2 = -1$

$x = \sqrt{-1}$???

$13 + 0i$

There is no solution over the real number system, therefore we extend into a new number system...the Complex Numbers.

→ $a + bi$, $a, b \in R$ $= 3 - 7i$

Real Part Imaginary Part

So what about this "i" that appears?

Most Important prinicple in complex number system →

$i^2 = -1$

$i = \sqrt{-1}$

What is $\sqrt{-36}$?

$\sqrt{36(-1)}$

$\sqrt{36 i^2}$

$\pm 6i$

Basic Operations involving Complex Numbers

I. Addition and Subtraction

$$(a+bi)+(c+di)=(a+c)+(b+d)i$$

Collect "real" terms   Collect "imaginary" terms

Example:
Express the following complex expression in standard form:

$$2(3-5i)-(7-5i)+2(-1+i)$$

$= 6-10i-7+5i-2+2i$

$= -3-3i$

II. Multiplication and Powers

$a+bi$

Examples:

a) $(2-i)(-1+3i)$

$i^2=-1$

$= -2+6i+i-3i^2$

$= -2+7i+3$

$= 1+7i$

b) $3-2(5-2i)^2$

$3-2(25-20i+4i^2)$

$3-50+40i-8i^2$

$= -39+40i$

c) $2i^5 - i^8 + (2i^3)^5$

← Clue:

$i^{17} = (i^2)^8 \cdot i^1$

$\rightarrow i$

$2(i^2)^2 i - (i^2)^4 + 32(i^2)^7 i$

$2i - 1 - 32i$

$= -1-30i$

III. Division

Before we can divide we must first review the concept of conjugates...

Conjugates

$$a+bi \Leftrightarrow a-bi$$

Means to take conjugate

$a-bi$

$a+bi$

Examine what happens when you multiply complex conjugates...

$$(2-5i)(2+5i)$$

$(7-3i)(7+3i)$

$4-25i^2$

$\rightarrow 4+25 = 29$

Now we are ready to try division...

-------▸ **Multiply the numerator and denominator by the conjugate of the denominator**

Example:

a) $\dfrac{2+4i}{1-i}\left(\dfrac{1+i}{1+i}\right)$ $a+bi$

$= \dfrac{2+6i+4i^2}{1-i^2}$

$= \dfrac{-2+6i}{2}$

$= -1+3i$

b) $\dfrac{(2-i)(-1+3i)}{(-3+2i)^2} = \dfrac{-79}{169} + \dfrac{47}{169}i$

Sheet
#1-4

Attachments

Answers to Sample Placement Test.htm